TB-7Z-020-EMC
Hardware User Manual

Rev.0.90

Preliminary

Revision History

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Introduction

Thank you for purchasing the TB-7Z-020-EMC board. Before using the product, be sure to carefully read this user manual and fully understand how to correctly use the product. First read through this manual, then always keep it handy.

SAFETY PRECAUTIONS

Be sure to observe these precautions

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

Before using the product, read these safety precautions carefully to assure correct use.
These precautions contain serious safety instructions that must be observed.
After reading through this manual, be sure to always keep it handy.

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual.
(Examples)

	Turn off the power switch.
	Do not disassemble the product.
	Do not attempt this.

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Warning	
	In the event of a failure, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	If an unpleasant smell or smoking occurs, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	Do not disassemble, repair or modify the product. Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	Do not touch a cooling fan. As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
	Do not place the product on unstable locations. Otherwise, it may drop or fall, resulting in injury to persons or failure.
	If the product is dropped or damaged, do not use it as is. Otherwise, a fire or electric shock may occur.
	Do not touch the product with a metallic object. Otherwise, a fire or electric shock may occur.
	Do not place the product in dusty or humid locations or where water may splash. Otherwise, a fire or electric shock may occur.
	Do not get the product wet or touch it with a wet hand. Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	Do not touch a connector on the product (gold-plated portion). Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

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Caution	
	Do not use or place the product in the following locations. Humid and dusty locations Airless locations such as closet or bookshelf Locations which receive oily smoke or steam Locations exposed to direct sunlight Locations close to heating equipment Closed inside of a car where the temperature becomes high Staticky locations Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
	Do not place heavy things on the product. Otherwise, the product may be damaged.

Disclaimer

This product is an evaluation board for Xilinx Zynq AP SoC FPGA. Tokyo Electron Device Limited assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, Tokyo Electron Device Limited assumes no responsibility for any damages caused by:

(1) Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
(2) Secondary impact arising from use of this product or its unusable state (business interruption or others)
(3) Use of this product against the instructions given in this manual.
(4) Malfunctions due to connection to other devices.

Tokyo Electron Device Limited assumes no responsibility or liability for:

(1) Erasure or corruption of data arising from use of this product.
(2) Any consequences or other abnormalities arising from use of this product, or
(3) Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.
Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.
The specification of this product is subject to change without prior notice.
The product is subject to discontinuation without prior notice.

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1. Related Documents and Accessories

Related documents:
All documents relating to this board can be downloaded from our website. Please see attached paper on the products.

Accessories.
- RS-232C/CAN Bus Cable x1
- microSD card 4GB x1
- Power Supply x1
- Spacer Set

2. Overview

The TB-7Z-020-EMC evaluation board for the Zynq™-7000 All Programmable SoC provides a hardware environment for developing and evaluating designs targeting the Zynq™-7000 XC7Z020-1CLG484. The TB-7Z-020-EMC provides features common to many embedded processing systems, including DDR3 SDRAM component memory, a 10/100/1000 Ethernet PHY, general purpose I/O, a DVI Transmitter, a USB OTG 2.0 Port, a Pmod interface, a CAN interface and a UART interface. Other features can be supported using VITA-57 FPGA mezzanine cards (FMC) attached to either of two low pin count (LPC) FMC connectors.

3. Feature

Zynq-7000:	Xilinx XC7Z020-1CLG484
Memory:	1GByte (32Mword x 32bit x 8banks) DDR3 SDRAM Component
	128Mbit Quad SPI Flash
	Secure Digital Card (Connector)
Ethernet PHY:	Marvell's 88E1518-XX-NNB2C000 RGMII Interface with RJ45
USB OTG 2.0 Transceiver:	TI's TUSB1210BRHB
DVI Complaint Transmitter:	TI's TFP410PAP
RS232 Transceiver:	TI's MAX3232CPW with 2.0 pitch PinHeader
FMC Connector:	Samtec's ASP-134604-01 (FMC LPC MC) mounted on B-side
	Samtec's ASP-134603-01 (FMC LPC CC) mounted on the A-side
CAN Bus Transceiver:	PHILIPS's TXS0104EPWR with 2.0 pitch PinHeader
Pmod Connector:	Digilent Pmod™ compatible headers (2x6)
JTAG Port:	Standard Xilinx JTAG Interface with 14-pin 2.0 pitch PinHeader
	ARM JTAG + Logic Analyzer function Interface with Mictor-38 Connector
SD Card:	microSD Card connector
Oscillators:	Fixed 33.33333MHz LVCMOS oscillator
Clock Generator:	IDT's 5V49EE504NLGI

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4. Block Diagram

The TB-7Z-020-EMC board block diagram is shown in Figure 4-1.

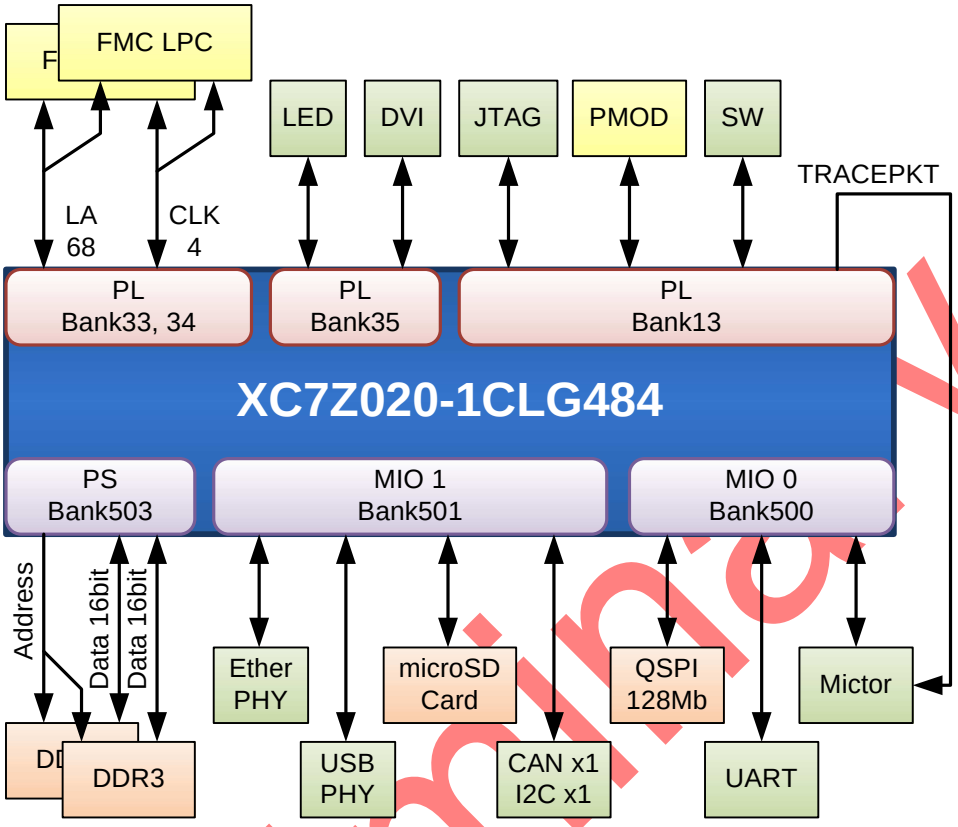

Figure 4-1 Block Diagram

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5. External View of the Board

The TB-7Z-020-EMC board external view is shown in Figure 5-1 and Figure 5-2.

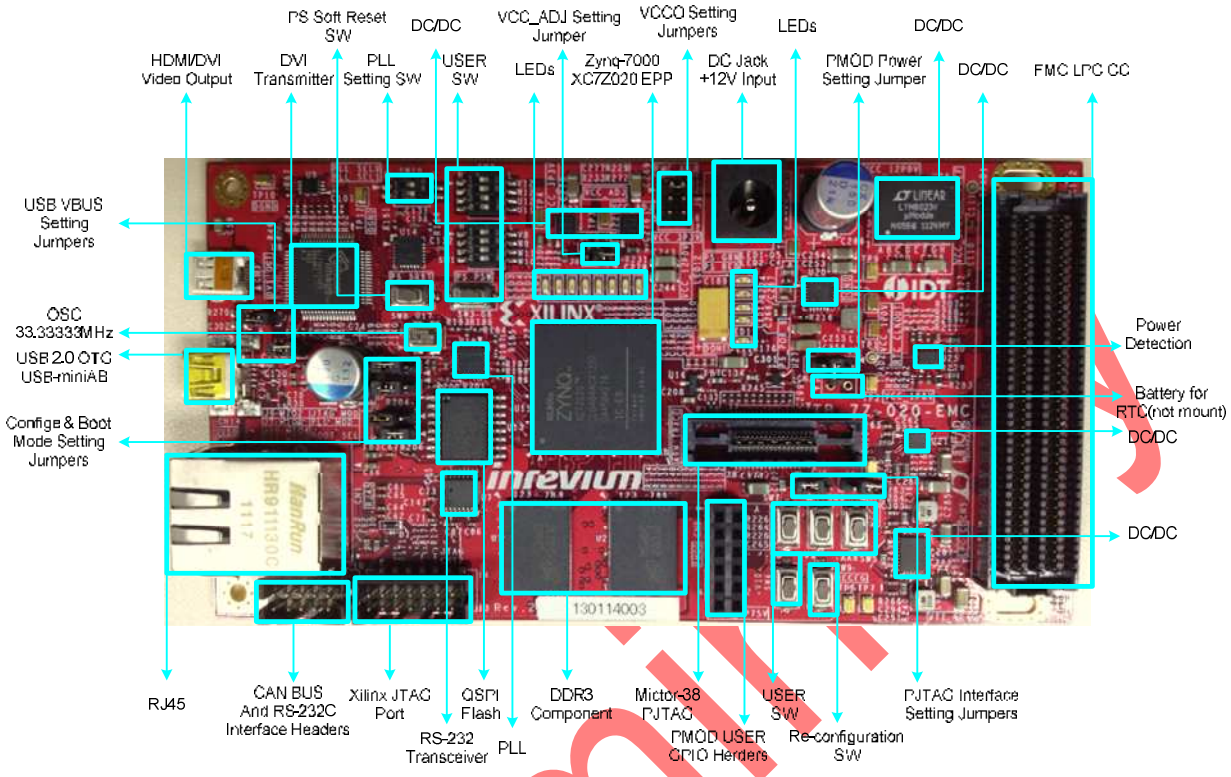

Figure 5-1 Component Side

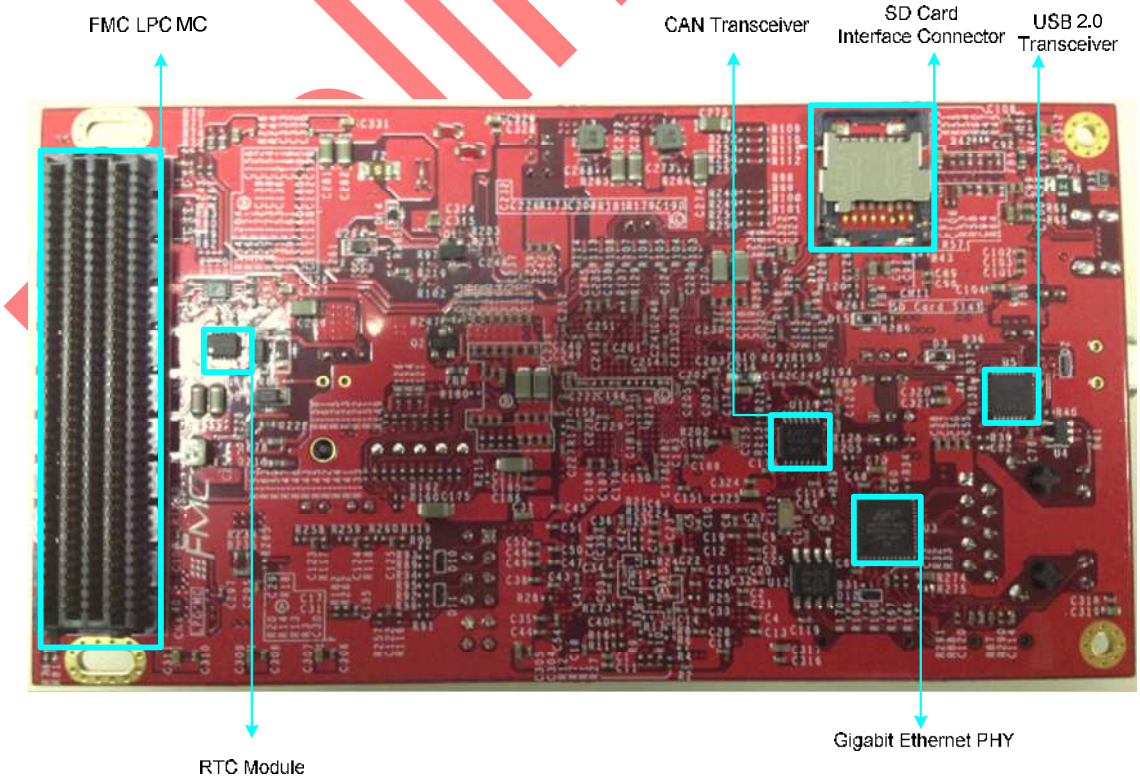

Figure 5-2 Solder Side

6. Board Specifications

The TB-7Z-020-EMC board specifications are showed in Figure 6-1 and Figure 6-2.

External Dimensions:	130 mm (W) x 69 mm (H)
Number of Layers:	12 layers
Board Thickness:	1.6 mm
Material:	FR-4
FMC LPC CC Connector:	Samtec's ASP-134603-01
FMC LPC MC Connector:	Samtec's ASP-134604-01
USB OTG Connector:	Molex's 67803-8020
RJ-45 connector:	HanRun's HR911130C
CAN & RS-232 connector:	one 2.0-pitch Header (2x5)
HDMI/DVI Video connector:	Molex's 046765-1001
Pmod connector:	Samtec's SSW-106-01-F-D
MICTOR Connector:	TE Connectivity's 2-5767004-2
SD Card Slot:	JAE's ST1W008S4ER1500
Xilinx JTAG connector:	Molex's 87832-1420
Power Input connector:	CUI Inc's PJ-006A

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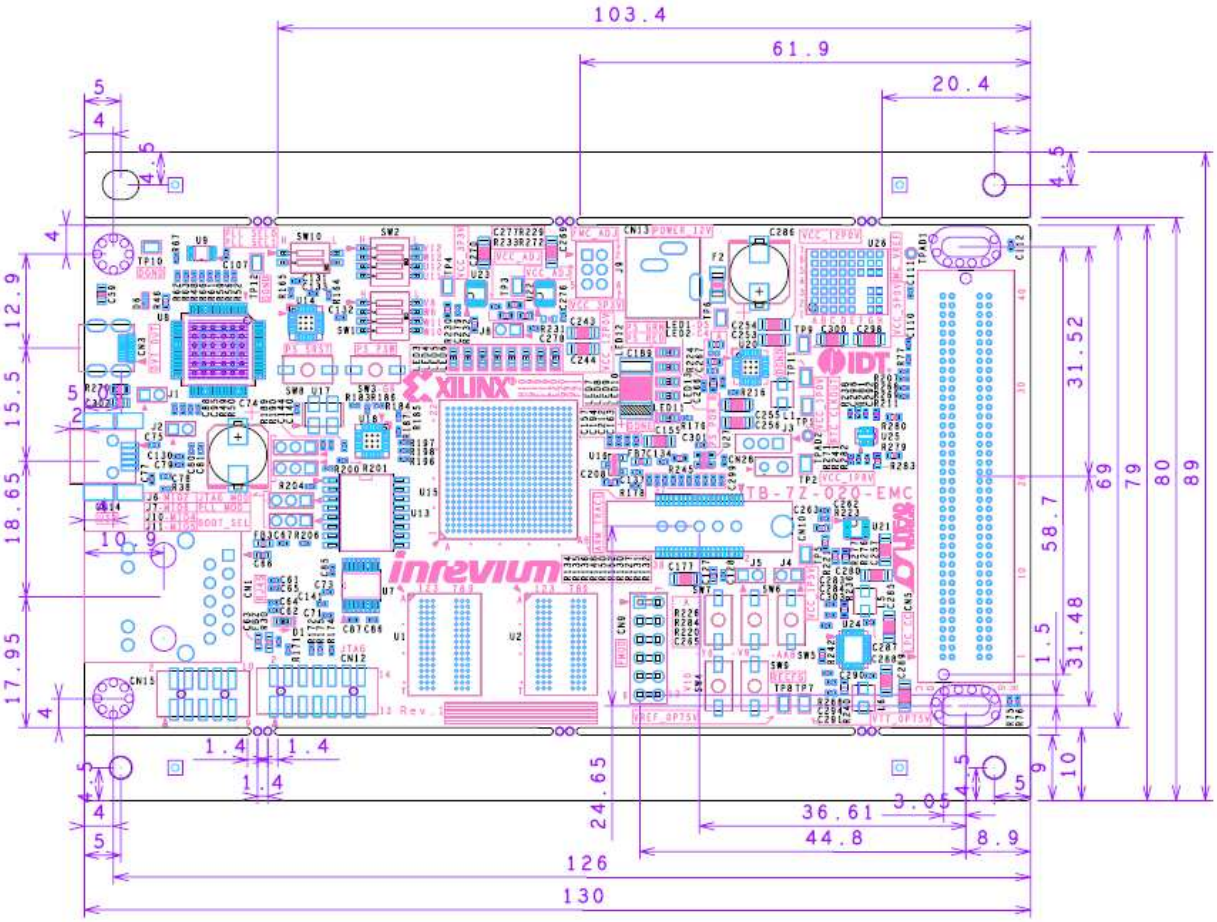

Figure 6-1 Board Dimensions (inclusive of wastable substrate, top view)

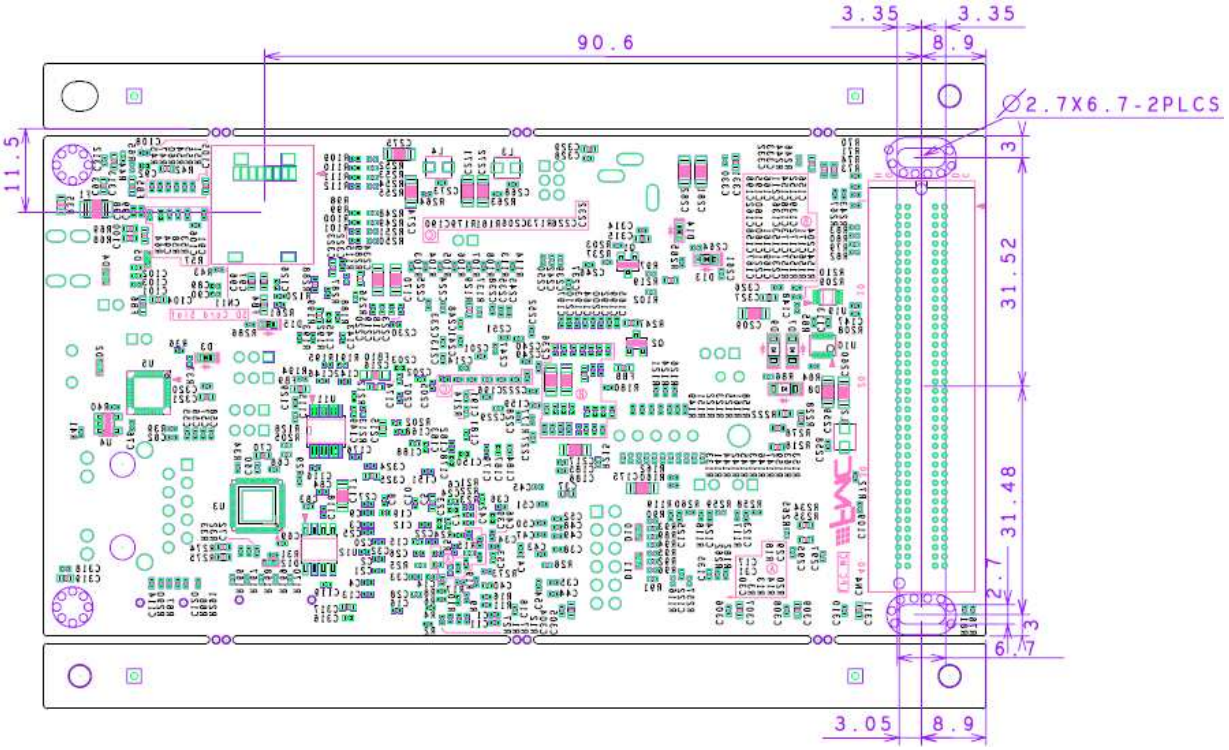

Figure 6-2 Board Dimensions (inclusive of wastable substrate, bottom view)

7. Description of Components

7.1. Power Supply Structure

TB-7Z-020-EMC board's power supply structure is showed in Figure 7-1.

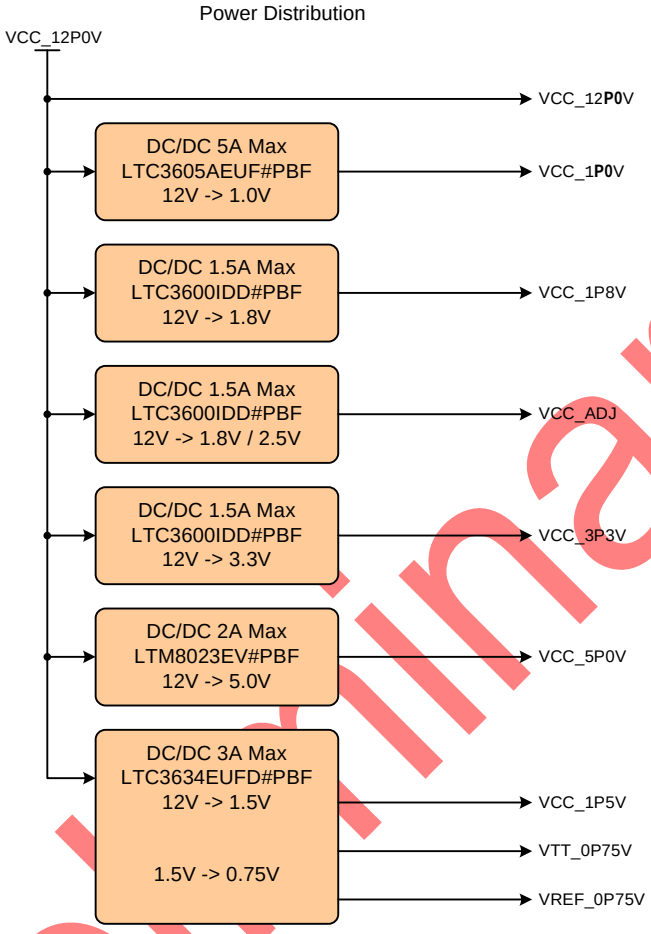

Figure 7-1 Power Supply Structure

7.1.1. DC Jack Connector

There is a DC Jack connector for +12V input voltage supply on board.
TB-7Z-020-EMC does not have a power switch.

Figure 7-2 DC Jack Connector

Important: Always, TB-7Z-020-EMC needs power from DC Jack connector.
When TB-7Z-020-EMC is connected to FPGA evaluation board, it is must be power up first and power down later.

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7.1.2. FP_VCCO_ADJ SEL Jumper

Bank 33 and 34 are connecting FMC connector. The bank voltage is depended on connected boards.
TB-7Z-020-EMC has a three selection for bank voltage.
VCC_3.3V: On-board 3.3V Power supply. Use case is that FMC option board interface is 3.3V.
VCC_ADV: On-board 2.5V/1.8V Power supply. Use case is that FMC option board interface is 2.5V/1.8V
Please refer section 7.1.3 VCC_ADJ SEL Jumper.
FMC_ADJ: Power supply from main FPGA evaluation board.
There is a 6 pin jumper (J9) for FP_VCCO_ADJ(Bank33 and 34) power selection.

Figure 7-3 FP_VCCO_ADJ SEL Jumper

7.1.3. VCC_ADJ SEL Jumper

TB-7Z-020-EMC has on board power supply of 2.5V/1.8V.
There is a 2 pin jumper (J8) for VCC_ADJ power selection.

Figure 7-4 VCC_ADJ SEL Jumper

Table 7-1 Power Setting

No.	Jumper No.	Description	Status	Function
8	J8	VCC_ADJ select	Short	1.8V
			Open	2.5V
9	J9	FP_VCCO_ADJ select	2-4	FMC_ADJ
			3-4	VCC_ADJ
			6-4	VCC_3P3V

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7.2. Clock System

The TB-7Z-020-EMC board's clock system diagram is showed in Figure 7-5.

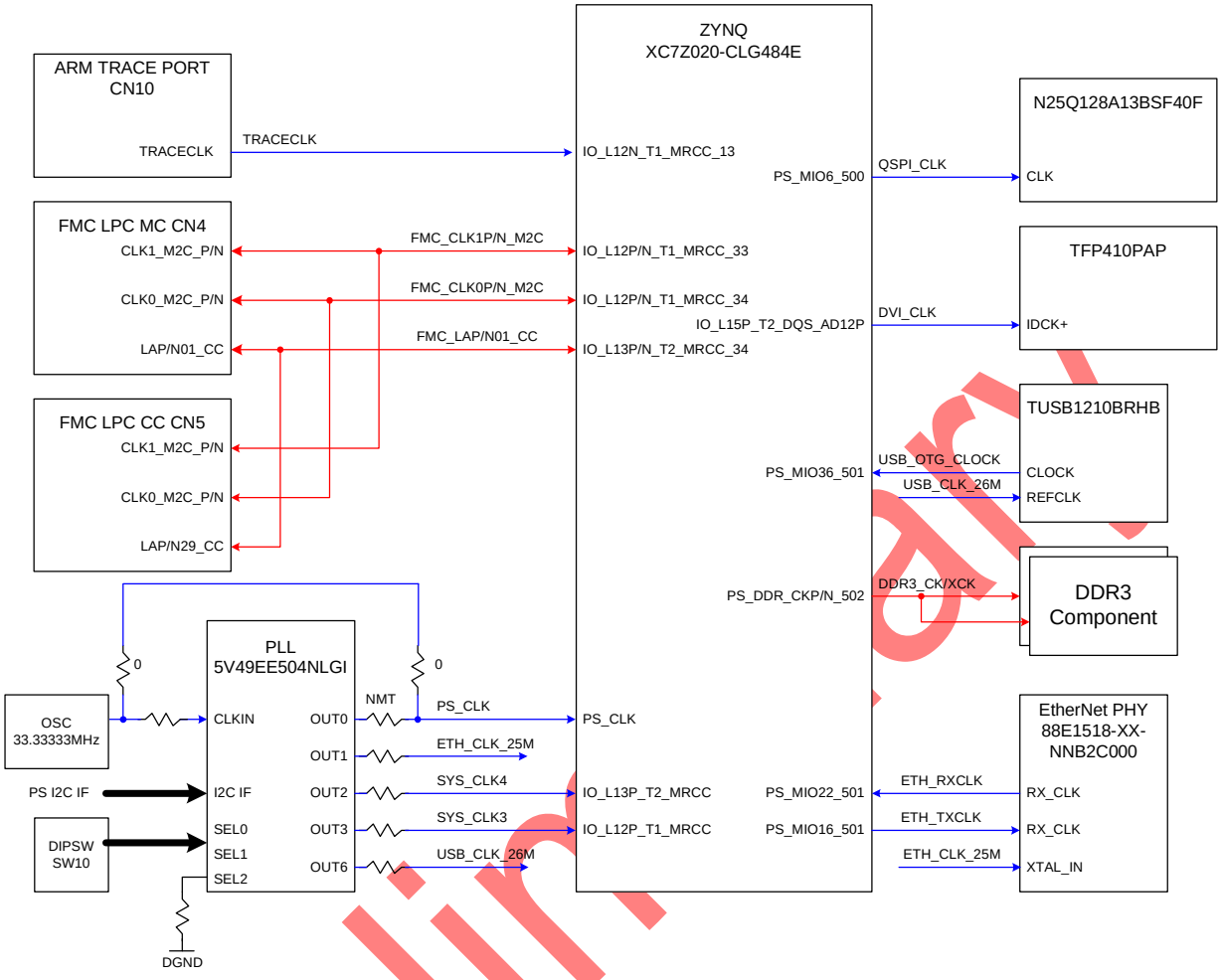

Figure 7-5 Clock System Diagram

7.3. On-board PLL

The TB-7Z-020-EMC has the on-board PLL. Please refer Figure 7-5.

IDT 5V49EE504NLGI is an external PLL. It could memory the setting of PLL via I2C interface which connected to PS (Processing System) I2C Bus. Please refer to the reference design of PLL setting and Section 7.4 I2C BUS.

OUT #	Connect to	Frequency	Note
0	Not connected	(33MHz)	Not Used
1	Ethernet PHY	25MHz	Do not needs to change settings
2	PL Clock	User Define	Default: 148.5MHz(DVI)
3	PL Clock	User Define	Default: 25MHz
6	USB PHY	26MHz	Do not needs to change settings

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7.4. I2C BUS

The TB-7Z-020-EMC board implements a single I2C port on the Zynq AP SoC PS.
The I2C Bus topology is shown in Figure 7-6.

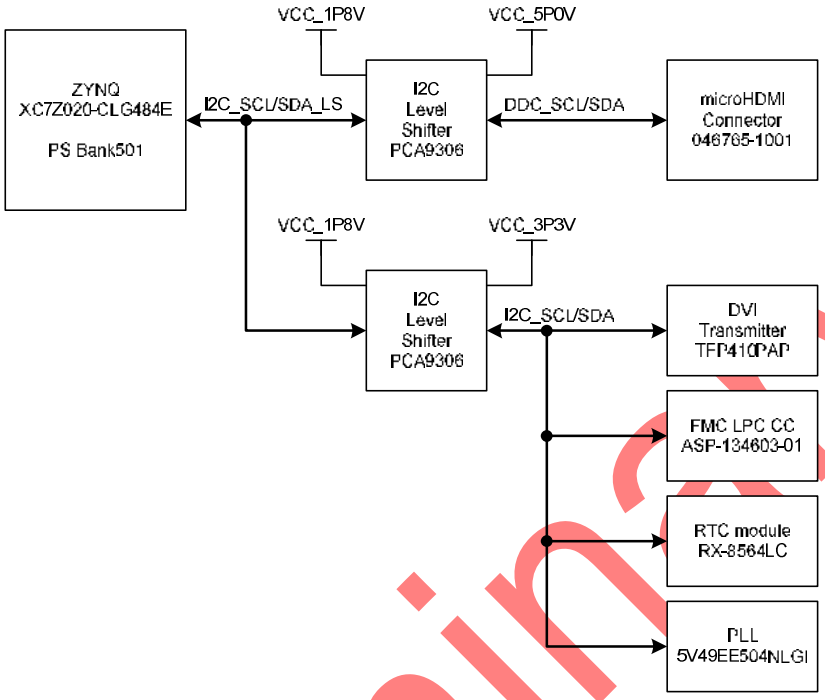

Figure 7-6 I2C Bus Topology

Table 7-2 I2C Address Map

No.	Device	Write Address	Read Address
1	046765-1001	Custom	Custom
2	TFP410PAP	01110000	01110001
3	ASP-134603-01	Custom	Custom
4	RX-8564LC	1010001	1010001
5	5V49EE504NLGI	1101010	1101010

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7.5. Memory

Zynq AP SoC contains a hardened PS memory interface unit. The memory interface unit includes a dynamic memory controller and static memory interface modules.

7.5.1. DDR3

The board includes two Micron MT41J256M16RE-15E:D DDR3 memory components creating a 32-bit interface. The DDR3 is connected to the hard memory controller in the PS.

The PS incorporates both the DDR controller and the associated PHY, including its own set of dedicated I/Os. The PS DDR3 memory interface speeds up to 533MHz (1066Mbps) are supported.

Device : MT41J256M16RE-15E IT:D (Micron) 32 Meg x 16 x 8 banks

Device Data Rate : 667MHz (1333Mbs)

The DDR3 interface is shown in Figure 7-7.

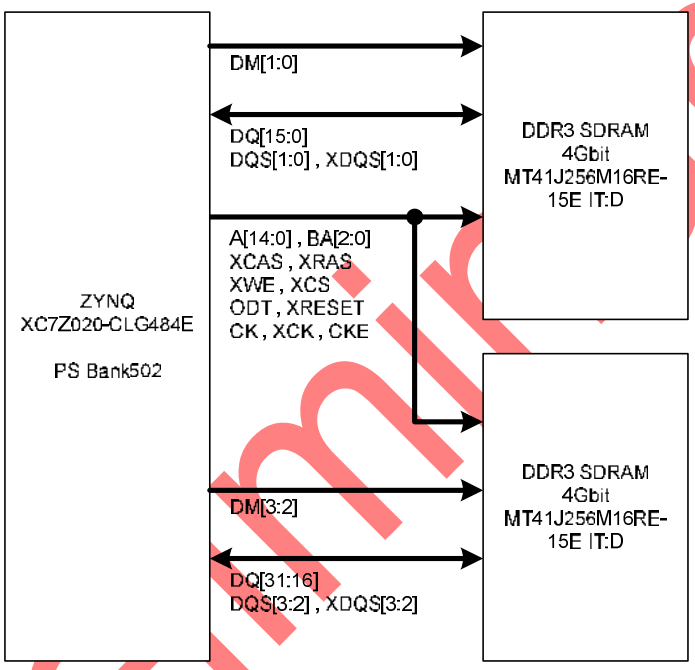

Figure 7-7 DDR3 Memory Connection

7.5.2. QSPI Flash

The Board includes a 4-bit QSPI (quad-SPI) NOR flash. The Micron N25Q128A13BSF40F is used on this board. The Multi-I/O SPI Flash memory is used to provide non-volatile code, and data storage.It can be used to initialize the PS as well as configure the PL (bitstream).

Device : N25Q128A13BSF40F (Micron) 128Mbit , x1/x2/x4 support

Device Data Rate : 108 MHz (maximum) clock frequency

The QSPI interface is shown in Figure 7-8.

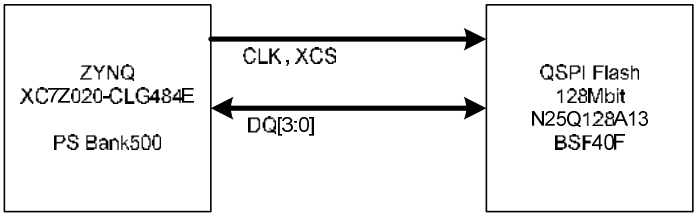

Figure 7-8 QSPI Connection

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7.5.3. SD Card Interface

The Zynq AP SoC PS SD/SDIO peripheral controls communication with the SD card. The SD card can be used for non-volatile external memory storage as well as booting the Zynq AP SoC.

Device Features : microSD Carf Slot ST1W 008S4ER1500 (JAE Electronics)
Media is 4GB uSD card support

The microSD Card interface is shown in Figure 7-9.

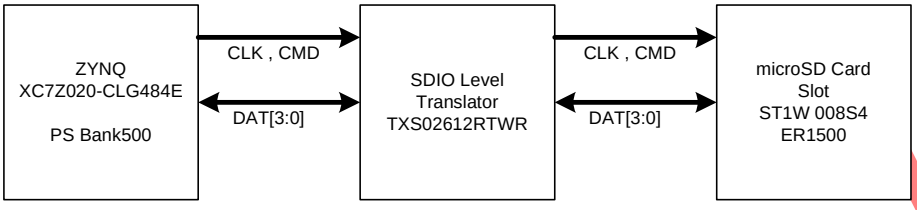

Figure 7-9 SD Card Slot Connection

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7.6. 10/100/1000 Ethernet PHY

TB-7Z-020-EMC has 10/100/1000 Base Ethernet PHY connected to the PS Ethernet MAC by RGMII. PHY chip is Marvell's 88E1518. The bit[0] of PHY address is 0.

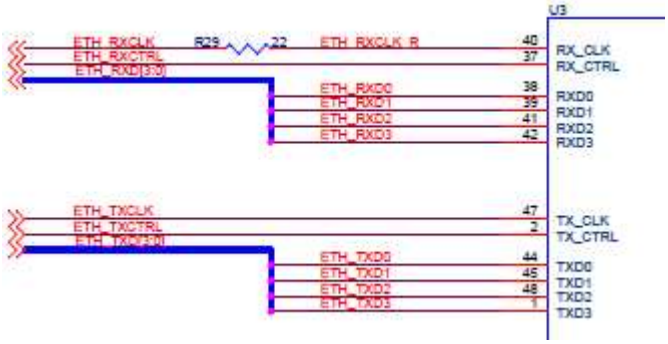

Figure 7-10 RGMII Connection

RJ-45 connector (HanRun's HY911130C) has internal LEDs.

To indicate the statuses of Ethernet PHY, LEDs are connected to PHY's signal LED0 and LED1 respectively.

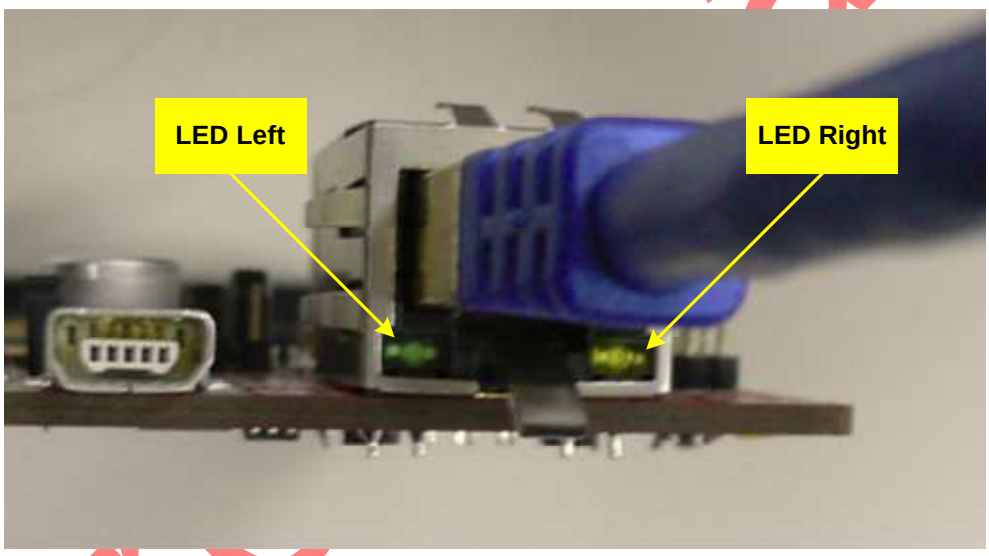

Figure 7-11 RJ-45 internal LED

The function description of RJ-45 internal LED is in the following table.

Table 7-3 RJ-45 internal LED Function Table

No.	LED No.	Color	Function	Target IC		
				IC No.	Pin No.	Pin Name
1	LED Left	Green	LED for 1000BASE-TX link/speed or link indicator.	U3	10	ETH_LED0
2	LED Right	Yellow	LED for Transmit Activity or RX/TX Activity/Link modes.	U3	9	ETH_LED1

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7.7. UART Interface

The TB-7Z-020-EMC board includes the TI MAX3232CPW RS-232 Line Driver/Receiver.

Device Features : MAX3232CPW (TI)

The UART interface is shown in Figure 7-12.

PinHeader to D-sub 9 pin convertion cable is included in TB-7Z-020-EMC. Please refer to connection in Figure 7-14.

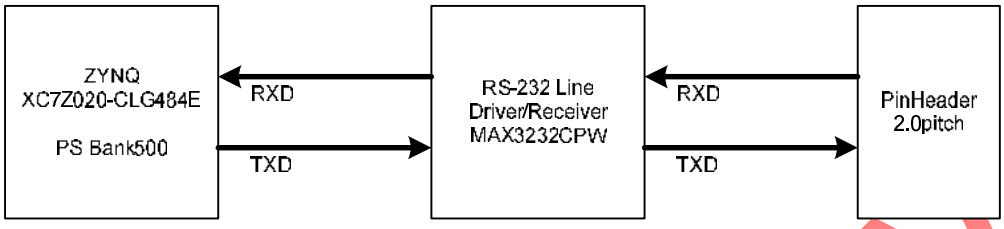

Figure 7-12 UART Connection

7.8. CAN BUS

The TB-7Z-020-EMC board includes the PHILIPS TJA1040T_VM_118.The TJA1040 is an advanced high speed Controller Area Network (CAN) transceiver for use in automotive and general industrial applications. It supports the differential bus signal representation described in the international standard for in-vehicle high speed CAN applications (ISO 11898).

Device Features : TJA1040T_VM_118 (PHILIPS)

The CAN interface is shown in Figure 7-13.

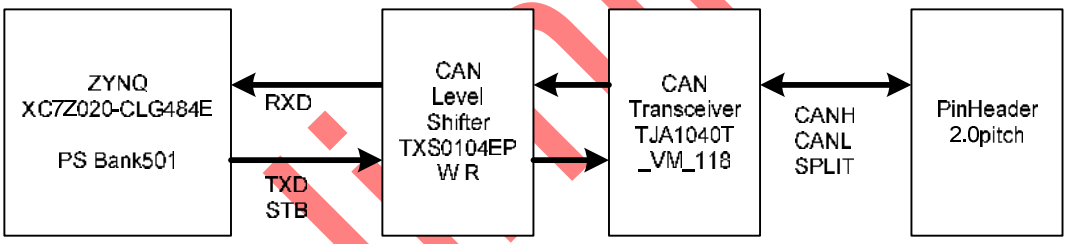

Figure 7-13 CAN Connection

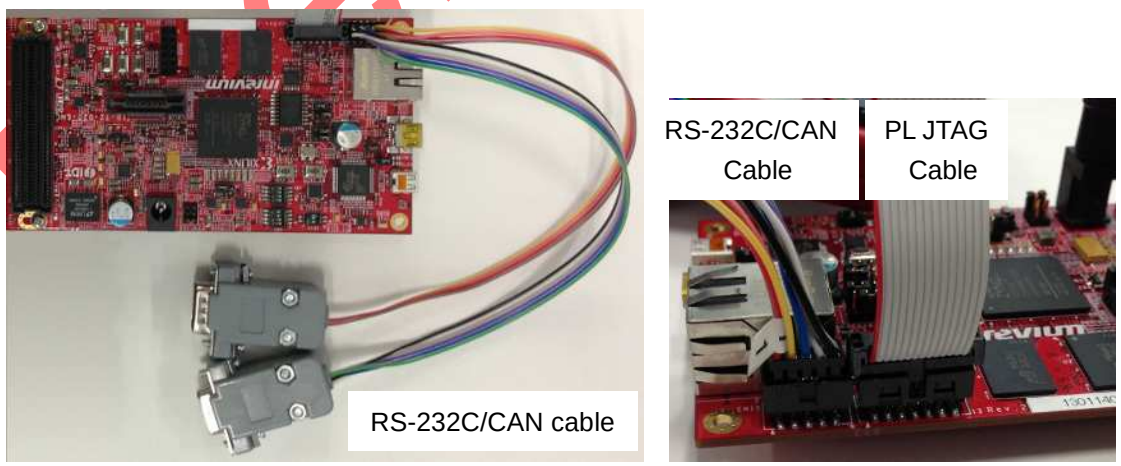

Figure 7-14 RS-232C/CAN Cable connection

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7.9. USB OTG

The TB-7Z-020-EMC board includes the TI TUSB1210 Standalone USB Transceiver Chip. It is used as the PHY. The PHY features a complete HS-USB Physical Front-End supporting speeds of up to 480Mbs.
Device Features : TUSB1210BRHB (TI)
The USB interface is shown in Figure 7-15.

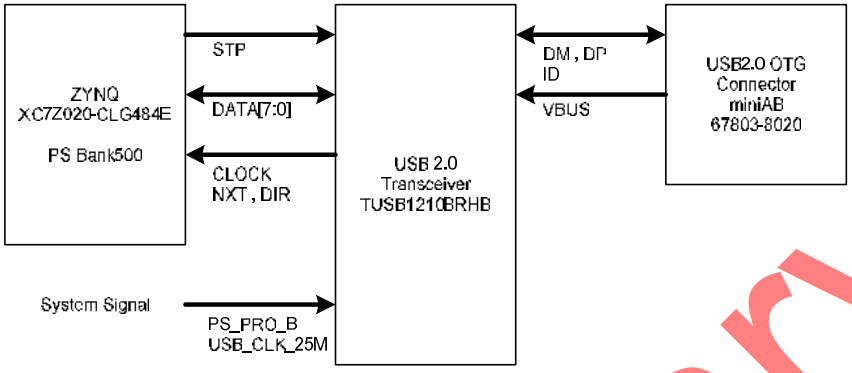

Figure 7-15 USB Connection

7.9.1. USB VBUS Power Supply SEL Jumper

There is a 2 pin jumper (J1) for USB VBUS power Supply selection.

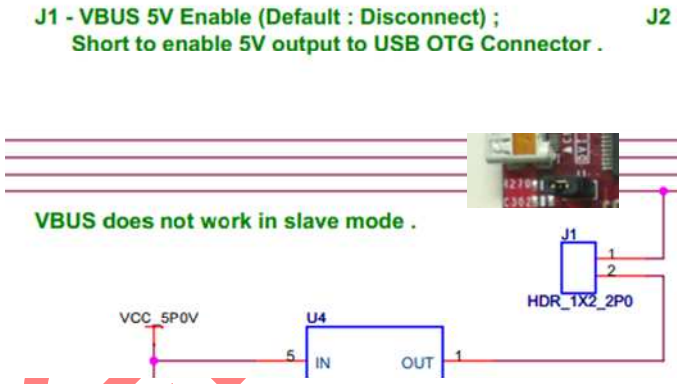

Figure 7-16 USB VBUS Power Supply SEL Jumper

Table 7-4 USB Settings

No.	Jumper No.	Description	Status	Function
1	J1	VBUS 5V Power Supply Enable	Short	Enable 5V output to USB Connector, while USB Transceiver is working in Host Mode.
			Open	Disable 5V output to USB Connector, while USB Transceiver is working in Slave Mode.
2	J2	USB VBUS Capacitor Setting	Short	For Host Mode (Cvbus > 129uF)
			Open	For Device or OTG modes (Cvbus=4.7uF)

Pre-nary

7.10. RTC

The TB-7Z-020-EMC board includes the Epson RX-8564LC RS-232.It is an I2C bus interface real-time clock that has a built-in 32.768 KHz oscillator with these features:

Frequency output options: 32.768 KHz, 1024 Hz, 32 Hz or 1 Hz

Calendar output functions: Year, month, day, weekday, hour, minute and second

Clock counter, alarm and fixed-cycle timer interrupt functions

The RTC interface is shown in Figure 7-17.

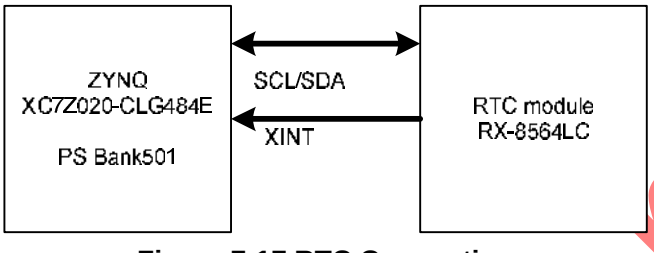

Figure 7-17 RTC Connection

Preliminary

7.11. Pmod

The TB-7Z-020-EMC board includes the Digilent Pmod compatible headers (2x6).It is straight,0.1" female headers that include eight user I/O plus 3.3V and ground signals.
The Pmod interface is shown in Figure 7-18.

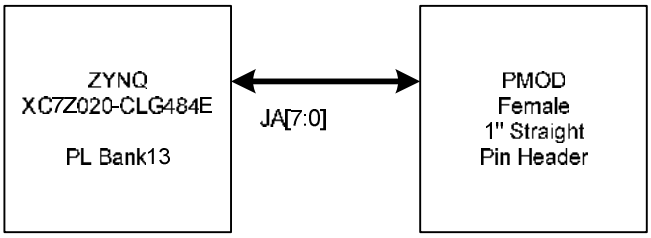

Figure 7-18 Pmod Connection

7.11.1. Pmod Power Supply SEL Jumper

There is a 3 pin jumper (J3) for Pmod Port's power selection.

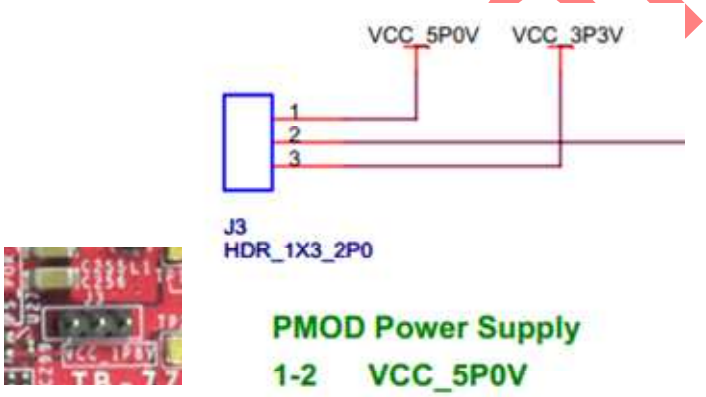

Figure 7-19 Pmod Port's Power SEL Jumper

Table 7-5 Pmod Power Setting

No.	Jumper No.	Description	Status	Function
3	J3	Pmod power supply selection	1-2 Short	Use VCC_5P0V power supply
			2-3 Short	Use VCC_3P3V power supply

7.12. Mictor 38

The TB-7Z-020-EMC board includes ARM Debugger Interface Connector (Mictor 38). It is intended for high-speed trace capture of up to 16 bits of trace data and status/sync signals. It can also be used to connect to the debug signals of the target.

The Mictor 38 interface is shown in Figure 7-20.

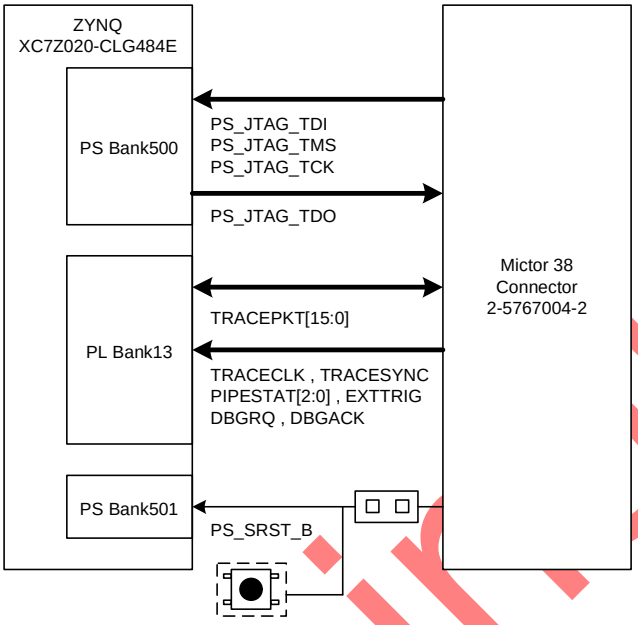

Figure 7-20 MICTOR 38 Connection

7.12.1. VTREF SEL Jumper

There is a 2 pin jumper (J5) for VTREF power supply.

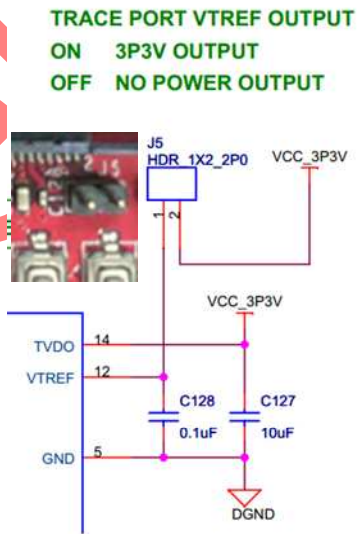

Figure 7-21 ARM PJTAG Port's VTREF SEL Jumper

Preliminary

Table 7-6 Jumper Function Table

No.	Jumper No.	Description	Status	Function
4	J4	ARM Trace Port Soft-reset enable	Short	Enable Soft-reset from ARM Trace Port
			Open	Soft-reset is only generated by SW8
5	J5	ARM Trace Port VTREF power Supply enable	Short	Enable 3.3V output to ARM Trace Port's VTREF pin.
			Open	Only connect a 0.1uF capacitor to ARM Trace Port's VTREF pin.

7.13. JTAG

The TB-7Z-020-EMC board provides a traditional Platform Cable JTAG connector.

The The JTAG Chain is constructed as follows:

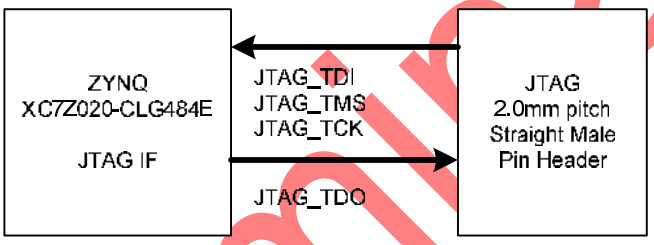

Figure 7-22 JTAG Connection

Preliminary

7.14. Reset Switches

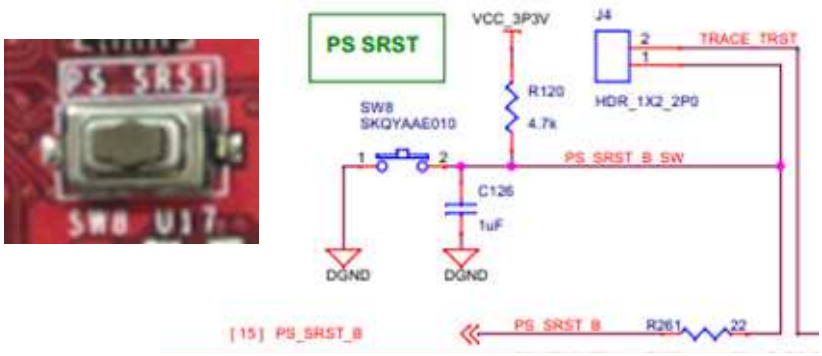

Figure 7-23 XC7Z020's Software Reset Push Switch

Preliminary

7.15. DVI Output

The TB-7Z-020-EMC board includes the TI TFP410PAP DVI Transmitter. It provides a digital video interface to the TB-7Z-020-EMC board. This 165MHz transmitter is DVI 1.0-compatible supporting 1080p and WUXGA at 60Hz.

Device Features : TFP410PAP (TI)

- Supports Pixel Rates Up to 165 MHz (Including 1080p and WUXGA at 60Hz)
- 12-Bit, Dual-Edge and 24-Bit, Single-Edge Input Modes
- Fully Differential and Single-Ended Input Clocking Modes
- Pin Compatible with SiI164 DVI Transmitter

The DVI interface is shown in Figure 7-24.

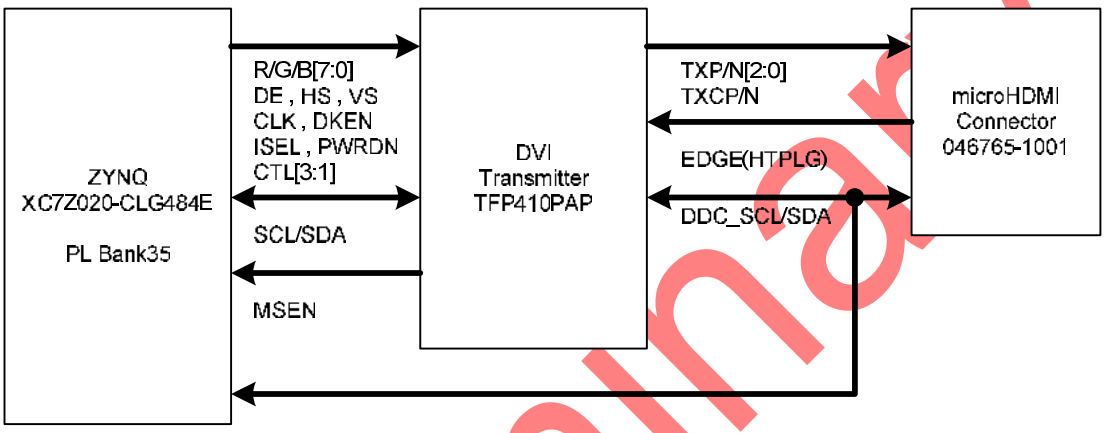

Figure 7-24 DVI Connection

Preliminary

7.16. FMC Connector Interface

The board provides Samtec's FMC Low-Pin Count Mezzanine Card (CN4) connector and Carrier Card (CN5). The VITA-57 Low-Pin Count pin list is showed in Figure 7-25 respectively.

Notice: Not all pins of LPC are connected to the Zynq-7000.

	K	J	H	G	F	E	D	C	B	A
1	NC	NC	VREF_A_M2C	GND	NC	NC	PG_C2M	GND	NC	NC
2	NC	NC	PRSNT_M2C_L	CLK1_M2C_P	NC	NC	GND	DP0_C2M_P	NC	NC
3	NC	NC	GND	CLK1_M2C_N	NC	NC	GND	DP0_C2M_N	NC	NC
4	NC	NC	CLK0_M2C_P	GND	NC	NC	GBTCLK0_M2C_P	GND	NC	NC
5	NC	NC	CLK0_M2C_N	GND	NC	NC	GBTCLK0_M2C_N	GND	NC	NC
6	NC	NC	GND	LA00_P_CC	NC	NC	GND	DP0_M2C_P	NC	NC
7	NC	NC	LA02_P	LA00_N_CC	NC	NC	GND	DP0_M2C_N	NC	NC
8	NC	NC	LA02_N	GND	NC	NC	LA01_P_CC	GND	NC	NC
9	NC	NC	GND	LA03_P	NC	NC	LA01_N_CC	GND	NC	NC
10	NC	NC	LA04_P	LA03_N	NC	NC	GND	LA06_P	NC	NC
11	NC	NC	LA04_N	GND	NC	NC	LA05_P	LA06_N	NC	NC
12	NC	NC	GND	LA08_P	NC	NC	LA05_N	GND	NC	NC
13	NC	NC	LA07_P	LA08_N	NC	NC	GND	GND	NC	NC
14	NC	NC	LA07_N	GND	NC	NC	LA09_P	LA10_P	NC	NC
15	NC	NC	GND	LA12_P	NC	NC	LA09_N	LA10_N	NC	NC
16	NC	NC	LA11_P	LA12_N	NC	NC	GND	GND	NC	NC
17	NC	NC	LA11_N	GND	NC	NC	LA13_P	GND	NC	NC
18	NC	NC	GND	LA16_P	NC	NC	LA13_N	LA14_P	NC	NC
19	NC	NC	LA15_P	LA16_N	NC	NC	GND	LA14_N	NC	NC
20	NC	NC	LA15_N	GND	NC	NC	LA17_P_CC	GND	NC	NC
21	NC	NC	GND	LA20_P	NC	NC	LA17_N_CC	GND	NC	NC
22	NC	NC	LA19_P	LA20_N	NC	NC	GND	LA18_P_CC	NC	NC
23	NC	NC	LA19_N	GND	NC	NC	LA23_P	LA18_N_CC	NC	NC
24	NC	NC	GND	LA22_P	NC	NC	LA23_N	GND	NC	NC
25	NC	NC	LA21_P	LA22_N	NC	NC	GND	GND	NC	NC
26	NC	NC	LA21_N	GND	NC	NC	LA26_P	LA27_P	NC	NC
27	NC	NC	GND	LA25_P	NC	NC	LA26_N	LA27_N	NC	NC
28	NC	NC	LA24_P	LA25_N	NC	NC	GND	GND	NC	NC
29	NC	NC	LA24_N	GND	NC	NC	TCK	GND	NC	NC
30	NC	NC	GND	LA29_P	NC	NC	TDI	SCL	NC	NC
31	NC	NC	LA28_P	LA29_N	NC	NC	TDO	SDA	NC	NC
32	NC	NC	LA28_N	GND	NC	NC	3P3VAUX	GND	NC	NC
33	NC	NC	GND	LA31_P	NC	NC	TMS	GND	NC	NC
34	NC	NC	LA30_P	LA31_N	NC	NC	TRST_L	GA0	NC	NC
35	NC	NC	LA30_N	GND	NC	NC	GA1	12P0V	NC	NC
36	NC	NC	GND	LA33_P	NC	NC	3P3V	GND	NC	NC
37	NC	NC	LA32_P	LA33_N	NC	NC	GND	12P0V	NC	NC
38	NC	NC	LA32_N	GND	NC	NC	3P3V	GND	NC	NC
39	NC	NC	GND	VADJ	NC	NC	GND	3P3V	NC	NC
40	NC	NC	VADJ	GND	NC	NC	3P3V	GND	NC	NC
			LPC Connector	LPC Connector			LPC Connector	LPC Connector		

Figure 7-25 FMC LPC Pin List

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7.16.1. FMC Low-Pin Count Mezzanine Card (CN4) connector.

Table 7-7 FMC LPC MC Connector pin assignment table (CN4)

Connection	C		D	Connection
GND	GND	1	PG_C2M	-
-	DP0_C2M_P	2	GND	GND
-	DP0_C2M_N	3	GND	GND
GND	GND	4	GBTCLK0_M2C_P	-
GND	GND	5	GBTCLK0_M2C_N	-
-	DP0_M2C_P	6	GND	GND
-	DP0_M2C_N	7	GND	GND
GND	GND	8	LA01_P_CC	FMC_LAP29
GND	GND	9	LA01_N_CC	FMC_LAN29
FMC_LAP28	LA06_P	10	GND	GND
FMC_LAN28	LA06_N	11	LA05_P	FMC_LAP24
GND	GND	12	LA05_N	FMC_LAN24
GND	GND	13	GND	GND
FMC_LAP21	LA10_P	14	LA09_P	FMC_LAP25
FMC_LAN21	LA10_N	15	LA09_N	FMC_LAN25
GND	GND	16	GND	GND
GND	GND	17	LA13_P	FMC_LAP20
FMC_LAP15	LA14_P	18	LA13_N	FMC_LAN20
FMC_LAN15	LA14_N	19	GND	GND
GND	GND	20	LA17_P_CC	FMC_LAP17_CC
GND	GND	21	LA17_N_CC	FMC_LAN17_CC
FMC_LAP11	LA18_P_CC	22	GND	GND
FMC_LAN11	LA18_N_CC	23	LA23_P	FMC_LAP12
GND	GND	24	LA23_N	FMC_LAN12
GND	GND	25	GND	GND
FMC_LAP07	LA27_P	26	LA26_P	FMC_LAP08
FMC_LAN07	LA27_N	27	LA26_N	FMC_LAN08
GND	GND	28	GND	GND
GND	GND	29	TCK	-
-	SCL	30	TDI	-
-	SDA	31	TDO	-
GND	GND	32	※1 3P3VAUX	-
GND	GND	33	TMS	-
-	GA0	34	TRST_L	-
-	12P0V	35	GA1	-
GND	GND	36	3P3V	-
-	12P0V	37	GND	GND
GND	GND	38	3P3V	-
-	3P3V	39	GND	GND
GND	GND	40	3P3V	-

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Connection	G		H	Connection
GND	GND	1	VREF_A_M2C	TPAD1
FMC_CLK1P_M2C	CLK1_M2C_P	2	PRSNT_M2C_L	-
FMC_CLK1N_M2C	CLK1_M2C_N	3	GND	GND
GND	GND	4	CLK0_M2C_P	FMC_CLK0P_M2C
GND	GND	5	CLK0_M2C_N	FMC_CLK0N_M2C
FMC_LAP33	LA00_P_CC	6	GND	GND
FMC_LAN33	LA00_N_CC	7	LA02_P	FMC_LAP32
GND	GND	8	LA02_N	FMC_LAN32
FMC_LAP31	LA03_P	9	GND	GND
FMC_LAN31	LA03_N	10	LA04_P	FMC_LAP30
GND	GND	11	LA04_N	FMC_LAN30
FMC_LAP26	LA08_P	12	GND	GND
FMC_LAN26	LA08_N	13	LA07_P	FMC_LAP27
GND	GND	14	LA07_N	FMC_LAN27
FMC_LAP23	LA12_P	15	GND	GND
FMC_LAN23	LA12_N	16	LA11_P	FMC_LAP22
GND	GND	17	LA11_N	FMC_LAN22
FMC_LAP16	LA16_P	18	GND	GND
FMC_LAN16	LA16_N	19	LA15_P	FMC_LAP19
GND	GND	20	LA15_N	FMC_LAN19
FMC_LAP13	LA20_P	21	GND	GND
FMC_LAN13	LA20_N	22	LA19_P	FMC_LAP18_CC
GND	GND	23	LA19_N	FMC_LAN18_CC
FMC_LAP09	LA22_P	24	GND	GND
FMC_LAN09	LA22_N	25	LA21_P	FMC_LAP14
GND	GND	26	LA21_N	FMC_LAN14
FMC_LAP05	LA25_P	27	GND	GND
FMC_LAN05	LA25_N	28	LA24_P	FMC_LAP10
GND	GND	29	LA24_N	FMC_LAN10
FMC_LAP01_CC	LA29_P	30	GND	GND
FMC_LAN01_CC	LA29_N	31	LA28_P	FMC_LAP06
GND	GND	32	LA28_N	FMC_LAN06
FMC_LAP03	LA31_P	33	GND	GND
FMC_LAN03	LA31_N	34	LA30_P	FMC_LAP04
GND	GND	35	LA30_N	FMC_LAN04
FMC_LAP00_CC	LA33_P	36	GND	GND
FMC_LAN00_CC	LA33_N	37	LA32_P	FMC_LAP02
GND	GND	38	LA32_N	FMC_LAN02
FMC_ADJ	VADJ	39	GND	GND
GND	GND	40	VADJ	FMC_ADJ

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7.16.2. FMC Low-Pin Count Carrier Card (CN5) connector.

Table 7-8 FMC LPC CC Connector pin assignment table (CN5)

Connection	C		D	Connection
GND	GND	1	PG_C2M	-
-	DP0_C2M_P	2	GND	GND
-	DP0_C2M_N	3	GND	GND
GND	GND	4	GBTCLK0_M2C_P	-
GND	GND	5	GBTCLK0_M2C_N	-
-	DP0_M2C_P	6	GND	GND
-	DP0_M2C_N	7	GND	GND
GND	GND	8	LA01_P_CC	FMC_LAP01_CC
GND	GND	9	LA01_N_CC	FMC_LAN01_CC
FMC_LAP06	LA06_P	10	GND	GND
FMC_LAN06	LA06_N	11	LA05_P	FMC_LAP05
GND	GND	12	LA05_N	FMC_LAN05
GND	GND	13	GND	GND
FMC_LAP10	LA10_P	14	LA09_P	FMC_LAP09
FMC_LAN10	LA10_N	15	LA09_N	FMC_LAN09
GND	GND	16	GND	GND
GND	GND	17	LA13_P	FMC_LAP20
FMC_LAP14	LA14_P	18	LA13_N	FMC_LAN20
FMC_LAN14	LA14_N	19	GND	GND
GND	GND	20	LA17_P_CC	FMC_LAP17_CC
GND	GND	21	LA17_N_CC	FMC_LAN17_CC
FMC_LAP18_CC	LA18_P_CC	22	GND	GND
FMC_LAN18_CC	LA18_N_CC	23	LA23_P	FMC_LAP23
GND	GND	24	LA23_N	FMC_LAN23
GND	GND	25	GND	GND
FMC_LAP27	LA27_P	26	LA26_P	FMC_LAP26
FMC_LAN27	LA27_N	27	LA26_N	FMC_LAN26
GND	GND	28	GND	GND
GND	GND	29	TCK	-
FMC_SCL	SCL	30	TDI	-
FMC_SDA	SDA	31	TDO	-
GND	GND	32	※1 3P3VAUX	-
GND	GND	33	TMS	-
FMC_I2C_A0	GA0	34	TRST_L	-
VCC_12P0V	12P0V	35	GA1	FMC_I2C_A1
GND	GND	36	3P3V	VCC_3P3V
VCC_12P0V	12P0V	37	GND	GND
GND	GND	38	3P3V	VCC_3P3V
VCC_3P3V	3P3V	39	GND	GND
GND	GND	40	3P3V	VCC_3P3V

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Connection	G		H	Connection
GND	GND	1	VREF_A_M2C	FMC_VREF
FMC_CLK1P_M2C	CLK1_M2C_P	2	PRSNT_M2C_L	-
FMC_CLK1N_M2C	CLK1_M2C_N	3	GND	GND
GND	GND	4	CLK0_M2C_P	FMC_CLK0P_M2C
GND	GND	5	CLK0_M2C_N	FMC_CLK0N_M2C
FMC_LAP00_CC	LA00_P_CC	6	GND	GND
FMC_LAN00_CC	LA00_N_CC	7	LA02_P	FMC_LAP02
GND	GND	8	LA02_N	FMC_LAN02
FMC_LAP03	LA03_P	9	GND	GND
FMC_LAN03	LA03_N	10	LA04_P	FMC_LAP04
GND	GND	11	LA04_N	FMC_LAN04
FMC_LAP08	LA08_P	12	GND	GND
FMC_LAN08	LA08_N	13	LA07_P	FMC_LAP07
GND	GND	14	LA07_N	FMC_LAN07
FMC_LAP12	LA12_P	15	GND	GND
FMC_LAN12	LA12_N	16	LA11_P	FMC_LAP11
GND	GND	17	LA11_N	FMC_LAN11
FMC_LAP16	LA16_P	18	GND	GND
FMC_LAN16	LA16_N	19	LA15_P	FMC_LAP15
GND	GND	20	LA15_N	FMC_LAN15
FMC_LAP20	LA20_P	21	GND	GND
FMC_LAN20	LA20_N	22	LA19_P	FMC_LAP19
GND	GND	23	LA19_N	FMC_LAN19
FMC_LAP22	LA22_P	24	GND	GND
FMC_LAN22	LA22_N	25	LA21_P	FMC_LAP21
GND	GND	26	LA21_N	FMC_LAN21
FMC_LAP25	LA25_P	27	GND	GND
FMC_LAN25	LA25_N	28	LA24_P	FMC_LAP24
GND	GND	29	LA24_N	FMC_LAN24
FMC_LAP29	LA29_P	30	GND	GND
FMC_LAN29	LA29_N	31	LA28_P	FMC_LAP28
GND	GND	32	LA28_N	FMC_LAN28
FMC_LAP31	LA31_P	33	GND	GND
FMC_LAN31	LA31_N	34	LA30_P	FMC_LAP30
GND	GND	35	LA30_N	FMC_LAN30
FMC_LAP33	LA33_P	36	GND	GND
FMC_LAN33	LA33_N	37	LA32_P	FMC_LAP32
GND	GND	38	LA32_N	FMC_LAN32
FMC_VCCO_ADJ	VADJ	39	GND	GND
GND	GND	40	VADJ	FMC_VCCO_ADJ

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7.17. Jumper

The function description of Jumper is in the following table.

Table 7-9 All Jumpers Function Table

No.	Jumper No.	Description	Status	Function
1	J1	VBUS 5V Power Supply Enable	Short	Enable 5V output to USB Connector, while USB Transceiver is working in Host Mode.
			Open	Disable 5V output to USB Connector, while USB Transceiver is working in Slave Mode.
2	J2	USB VBUS Capacitor Setting	Short	For Host Mode (Cvbus > 129uF)
			Open	For Device or OTG modes (Cvbus=4.7uF)
3	J3	Pmod power supply selection	1-2 Short	Use VCC_5P0V power supply
			2-3 Short	Use VCC_3P3V power supply
4	J4	ARM Trace Port Soft-reset enable	Short	Enable Soft-reset from ARM Trace Port
			Open	Soft-reset is only generated by SW8
5	J5	ARM Trace Port VTREF power Supply enable	Short	Enable 3.3V output to ARM Trace Port's VTREF pin.
			Open	Only connect a 0.1uF capacitor to ARM Trace Port's VTREF pin.
6	J6	Boot_Mode[3] / MIO[2]	1-2	VCC makes JTAG chains independent.
			2-3	GND cascades PS and PL JTAG chains.
7	J7	Boot_Mode[4] / MIO[6]	1-2	VCC bypasses internal PS PLLs.
			2-3	GND uses PS PLLs.
8	J8	VCC_ADJ select	Short	1.8V
			Open	2.5V
9	J9	FP_VCCO_ADJ select	2-4	FMC_ADJ
			3-4	VCC_ADJ
			6-4	VCC_3P3V
10	J10	Boot_Mode[1] / MIO[4]	1-2	Boot Device : SD Mode
			3-2	Boot Device : Quad-SPI / JTAG Mode
11	J11	Boot_Mode[2] / MIO[5]	1-2	Boot Mode : SD / Quad-SPI Mode
			3-2	Boot Mode : JTAG Mode

7.17.1. Boot Mode Settings

Table 7-10 Boot Mode Settings

No.	Boot Device	J10	J11	J6	J7
1	JTAG	3-2	3-2	2-3	2-3
2	SD Card	1-2	1-2	2-3	2-3
3	QSPI	3-2	1-2	2-3	203

Note: Usually, J6 and J7 are fixed setting.

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7.18. LED

There are 13 LEDs on the board. Some of These LEDs are used to indicate the statuses of XC7Z020, while the others provide user and general purpose I/O capabilities. The function description of LEDs is in the following table.

Table 7-11 LED Function Table

No.	LED No.	Color	Function	Target IC			Note
				IC No.	Pin No.	Pin Name	
1	LED1	Green	PS User LED.	U15	D5	PS_LED_GRN	
2	LED2	Red	PS User LED.	U15	C4	PS_LED_RED	
3	LED3	Green	PL User LED.	U15	H20	FP_LED0	
4	LED4	Green	PL User LED.	U15	G19	FP_LED1	
5	LED5	Green	PL User LED.	U15	F19	FP_LED2	
6	LED6	Green	PL User LED.	U15	E19	FP_LED3	
7	LED7	Green	PL User LED.	U15	E20	FP_LED4	
8	LED8	Green	PL User LED.	U15	G20	FP_LED5	
9	LED9	Green	PL User LED.	U15	G21	FP_LED6	
10	LED10	Green	PL User LED.	U15	F21	FP_LED7	
11	LED11	Green	FPGA bit file download is complete.	U15	T12	DONE	
12	LED12	Green	VCC_12P0V Power ON	TP6	-	VCC_12P0V	
13	LED13	Green	External power-on reset is release.	U15	B5	PS_POR_B	

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7.19. Push Switch

There are 3 switches on the board. The following table shows the details of the Push switches.

Table 7-12 Push Switch Function Table

No.	Switch No.	Description	Target IC		
			IC No.	Pin No.	Net Name
1	SW3	PS User Push Switch	U15	G6	PS_PUSHSW
2	SW4	PL User Push Switch	U15	V10	FP_PUSHSW0
3	SW5	PL User Push Switch	U15	AA8	FP_PUSHSW1
4	SW6	PL User Push Switch	U15	V9	FP_PUSHSW2
5	SW7	PL User Push Switch	U15	VY8	FP_PUSHSW3
6	SW8	Toggles XC7Z020's PS_SRST_B	U15	C9	PS_SRST_B
7	SW9	Toggles XC7Z020's PROG_B	U15	U12	PROG_B Only Initialize Logic Design

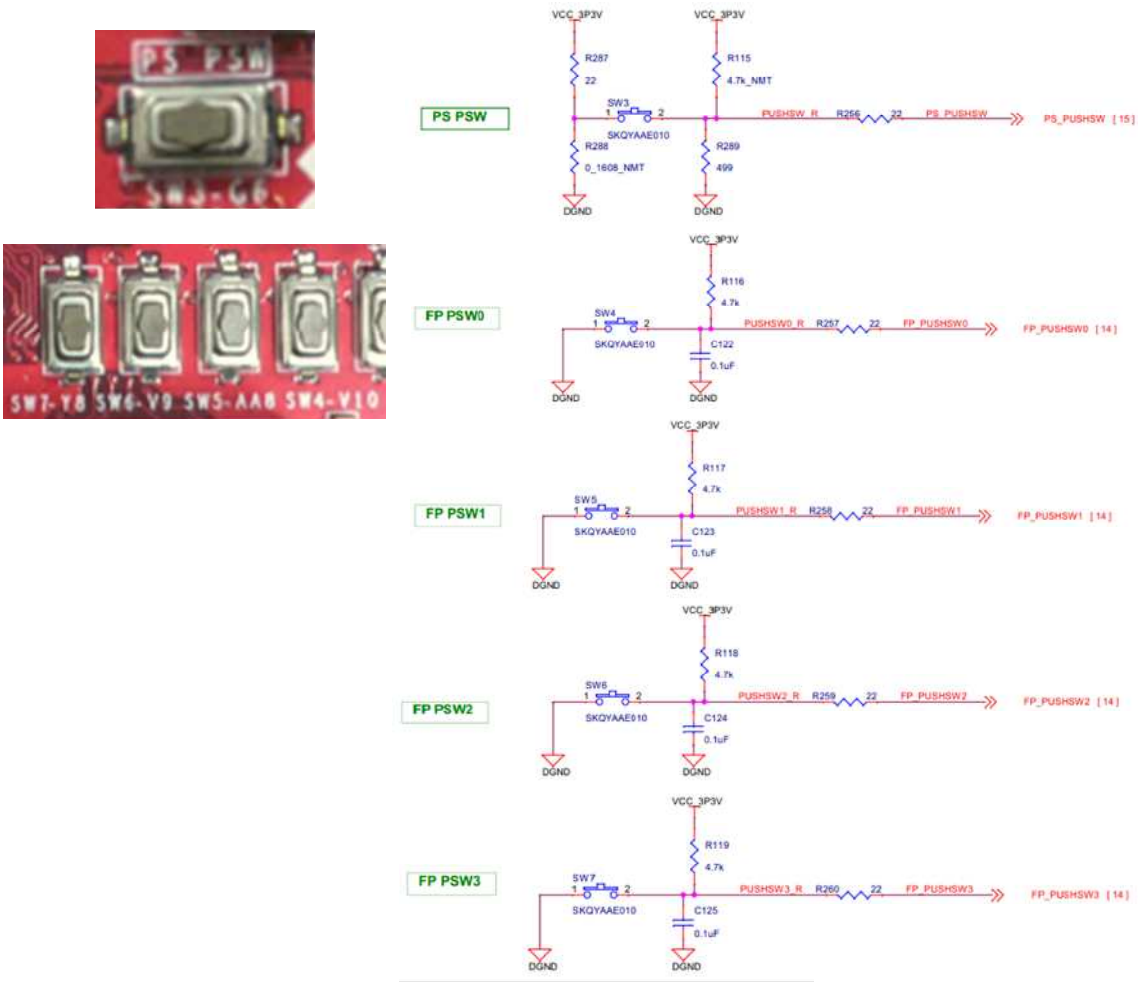

Figure 7-26 User Push Switch

7.20. Dip Switches

There are 3 switches on the board.

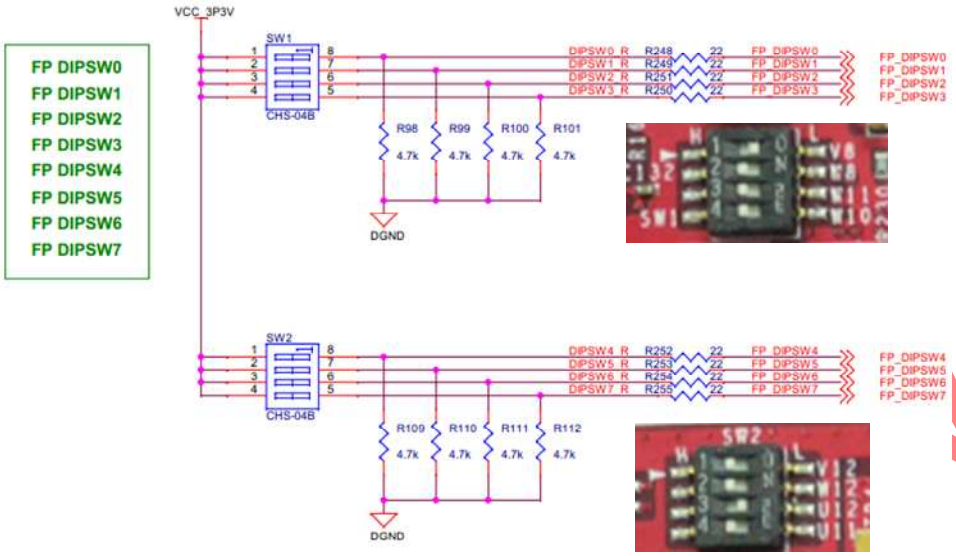

Figure 7-27 User Dip Switch

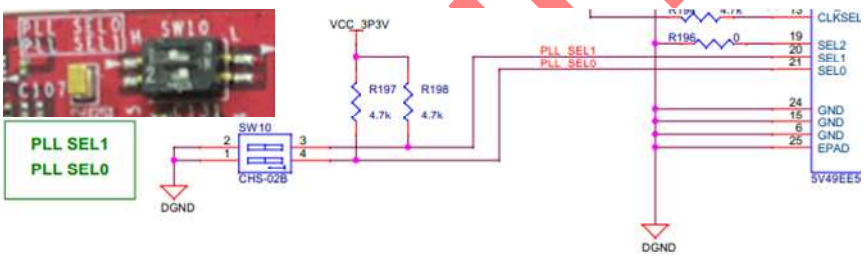

Figure 7-28 PLL Setting Dip Switch

The following table shows the details of the Dip switches.

Table 7-13 Dip Switch Function Table

No.	Switch No.	Description	Bits	Target IC		
				IC No.	Pin No.	Net Name
1	SW1	For PL User Dip Switch	1	U15	V8	FP_DIPSW0
2			2	U15	W8	FP_DIPSW1
3			3	U15	W11	FP_DIPSW2
4			4	U15	W10	FP_DIPSW3
5	SW2		1	U15	V12	FP_DIPSW4
6			2	U15	W12	FP_DIPSW5
7			3	U15	U12	FP_DIPSW6
8			4	U15	U11	FP_DIPSW7
9	SW10	For PLL Mode Setting	1	U18	21	PLL_SEL0
10			2	U18	20	PLL_SEL1

8. Default Settings

The following two tables show default settings of Jumpers and Dip Switches.

Table 8-1 Default Jumper Settings

No.	Jumper No.	Default Setting	Note
1	J1	Short	
2	J2	Short	
3	J3	Open	
4	J4	Open	
5	J5	Open	
6	J6	<2-3> Short	
7	J7	<2-3> Short	
8	J8	Open	
9	J9	<1-2> Short	
10	J10	<2-3> Short	
11	J11	<1-2> Short	

Table 8-2 Default Switch Settings

No.	Jumper No.	bit	Default Setting	Note
1	SW10	1	ON	
2		2	ON	
3	SW1	1	OFF	
4		2	OFF	
5		3	OFF	
6		4	OFF	
7	SW2	1	OFF	
8		2	OFF	
9		3	ON	
10		4	ON	

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